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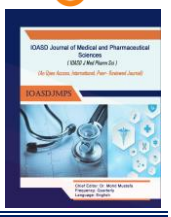

Neonatal Infection: A Review of Associated Risk Factors

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ABSTRACT

In 2018 the global neonatal death rate was 18 per 1000 live births, accounting for 2.5 million neonatal deaths. This represents approximately 7000 neonatal deaths every day. Among under five mortalities, more than two-fifth of deaths occur during the neonatal period and one third of these neonatal deaths are due to infection. Muhororo Hospital counted a neonatal infection rate of 22.5 per 1000 live births and in the quarter from July 2023 to December 2023 the rate increased to 24.3 per 1000 live births. Systemic signs of infection and isolation of a bacterial or other pathogen from the bloodstream manifest neonatal infection. Commonly known maternal risk factors for neonatal infection in high-income countries are chorioamnionitis, intrapartum maternal temperature above 38°C, delivery below 37weeks of gestation, membrane rupture beyond 18 hours, and vaginal group B streptococcus colonization. In a bid to reduce neonatal infection from 8.6% in June 2023 to 6.5% by June 2024, a study was conducted to know preventable risk factors for neonatal infection in Muhororo Hospital. The study enrolled all newborns in neonatology service with confirmed neonatal infection during data collection period. The study identified that Apgar score < 7, poor feeding, meconial amniotic fluid and home delivery were factors affecting or predispose for neonatal infection. Factors like gravidity of the mother, gestational age, type of amniotic fluid membrane rupture and the type of delivery were not significantly associated with neonatal infection.

Keywords: Neonatal Sepsis, Perinatal Risk Factors, Apgar Score, Meconium-Stained Amniotic Fluid, Neonatal Morbidity, Home Birth.

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1. INTRODUCTION

Neonatal infection rate is the number of neonates' infection estimated per 1000 live births. In 2018 the global neonatal death rate was 18 per 1000 live births, accounting for 2.5 million neonatal deaths. This represents approximately 7000 neonatal deaths every day. [1] Among under five mortalities, more than two-fifth of deaths occur during the neonatal period and one third of these neonatal deaths are due to infection. Among these deaths, 25% occur in South Asia and sub-Saharan Africa. [2] From July 2022 to June 2023, Muhororo Hospital counted a neonatal infection rate of 22.5 per 1000 live births and in the quarter from July 2023 to December 2023 the rate increased to 24.3 per 1000 live births. Neonatal infection is manifested by systemic signs of infection and isolation of a bacterial or other pathogen from the bloodstream. [3,4] Neonatal (0-28 days) deaths account for an estimated 44% of deaths in children under age 5 years. Around one-third of these, (640,000 in 2018) are caused by neonatal infections, including the clinical syndromes of sepsis, meningitis and pneumonia. [5] Neonatal infections, defined as bacteremia/sepsis, pneumonia, and meningitis, cause approximately 23.4% of neonatal deaths worldwide each year. [6] Referring to the Demographic and Health Survey Tanzania 2015/2016, most newborns (55%) did not receive any postnatal health check. [7] This should urgently be improved as most neonatal deaths occur within the first 48 hours of life and therefore contribute to a high mortality rate. In addition to preterm-birth and intrapartum-related complications, infection remains an important cause of morbidity and mortality within the neonatal period. Commonly known maternal risk factors for neonatal infection in high-income countries are chorioamnionitis, intrapartum maternal temperature above 38°C, delivery below 37weeks of gestation,

membrane rupture beyond 18 hours, and vaginal group B streptococcus colonization. [8] Neonatal infection during delivery mainly causes early-onset sepsis. [9] In contrast, late-onset sepsis mainly results from postnatal infection and is a typical complication of neonates with indwelling devices in intensive care units in contrast to early-onset sepsis, which is associated with maternal obstetrical complications. [10] Potential risk factors for an early-onset infection in low-income countries are HIV, maternal undernutrition, or placental malaria. For those who do become sick, timely detection of newborn illness with appropriate case management could prevent an estimated 84% of neonatal infection deaths. [11,12] These risk factors are associated with poor neonatal outcomes in sub-Saharan Africa; however, they have not been investigated in relation to the prevalence of neonatal infection. Despite the high burden of neonatal infection in Hospitals, interventions such as risk-based prevention is required to address preventable risks. In a bid to reduce neonatal infection from 8.6% to 6.5% by June 2024, a study was conducted to know preventable risk factors for neonatal infection in Muhororo Hospital.

2. METHODS AND MATERIALS

2.1 Study setting and period

The study was conducted from July 2023 to December 2023 in Muhororo Hospital.

2.2. Study design

A six months Hospital-based prospective cohort study with a cluster randomized control trial of newborns who were born in the six months of the data collection period was conducted. Mothers of the studies newborns were interviewed and Medical Record (MR) system was reviewed for electronic document review.

2.3. Source population

The source population was all lives birth who were born in Muhororo Hospital during the study period. A total of 1,027 lives births were recruited in the study.

2.4. Study population

All newborns who were admitted in neonatology service of Muhororo Hospital during the study period was the study population for this study (cases). All other newborns were considered as referent or comparison population (control). A total of 280 newborns who were admitted in neonatology ward was considered as cases and a total of 747lives birth discharged from maternity were considered as comparison or control.

2.5. Sampling methods

All newborns in neonatology service with confirmed neonatal infection during data collection period were enrolled in the study (convenience sampling method). At total of 25 newborns with confirmed infection were selected.

2.6. Data collection

2.6.1. Data collection tools and procedure

A pre-tested interviewer-administered questionnaire and check lists for document review was used to collect data. The tools were developed by reviewing different literature and information collected in book record for neonatology service.

2.6.2. Data analysis

The collected data were coded, entered and exported to SPSS for analysis. Descriptive statistics was used.

2.6.3. Data quality control

Data were collected by infection prevention control committee members in Muhororo Hospital. The questionnaire was pretested on similar population; newborns who were admitted in neonatology ward in the period before the study to assure the validity and modification accordingly.

2.7. Ethical considerations

Ethical clearance was obtained from the institutional ethic and research committee of Muhororo Hospital. A formal letter from the chairperson of ethic and research committee was written to infection prevention control committee of Muhororo Hospital granting permission to conduct the study. The study participants were assured confidentiality of information. The study participants were informed that they are free to withdraw from the study from any time. The study was conducted in accordance with Helsinki declaration.

3. RESULTS

Table 1: Neonatal characteristics

Variables	Frequency	Percentage
Characteristic of neonates at birth		
Apgar score at 1 minute		
Normal	12	60%
Abnormal	3	15%
Apgar score at 5 minutes		
Normal	14	70%
Abnormal	1	5%
Clinical symptoms of neonate at admission		
Neonatal infection risk (NNI)	6	30%

Variables	Frequency	Percentage
Poor feeding	6	30%
Respiratory distress	4	20%
Jaundice	3	15%
Other	1	5%
Gravidity of neonate's mother		
Primipale	8	40%
Multipale	12	60%
Estimated gestational age of neonate's mother		
Preterm pregnancy	2	10%
Term pregnancy	13	65%
Post term pregnancy	3	15%
Amniotic fluid status		
Clear	12	40%
Miconial	8	60%
Type of rupture of amniotic fluid membrane		
Spontaneous	16	80%
Artificial	4	20%

The UPGAR sore of the enrolled neonates at the 1st minute was normal for 60% of neonates against 15 which was abnormal. Five minutes after birth, another UPGAR test was performed; 70% of the studied neonates had normal UPGAR and 5% of them had abnormal UPGAR. Among the studied neonates, 30% presented poor feeding or were exposed to neonatal infection risk at the time of admission. 20% presented respiratory distress, jaundice was presented by 15% and 5% of them presented other non-listed symptoms. 15% of the study participants were born from the post term pregnancy and 10% were born from preterm pregnancy. 60% of the studied neonate were born in meconial amniotic fluid whereas 20% of amniotic fluid membrane were ruptured artificially.

Table 2: Obstetric characteristics of the mothers

Variables	Frequency	Percentage
Type of delivery		
Vaginal	14	70%
Primary C-section	5	25%
Repeat C-section	1	5%
Intrapartum antibiotic administration		
Yes	12	60%
No	8	40%
Reason of intrapartum antibiotic administration		
Prolonged latency	4	20%
Suspected amnionitis	4	20%
C-section prophylaxis	4	20%
Place of birth		
Hospital	16	80%
Health center	1	5%
Home delivery	3	15%

The study showed that 70% of the study participants were born through vaginal delivery and 25% were born by cesarean delivery. 60% of mothers of the study participants were given intrapartum antibiotic to prevent the suspected amnionitis (20%), for cesarean section prophylaxis (20%) and due to prolonged latency.

4. CONCLUSION

The study indicated that the prevalence of neonatal infection in Muhororo Hospital was 24.3 per 1000 live births from July-December 2023. In general, the study identified that Apgar score < 7, poor feeding, meconial amniotic fluid and home delivery were factors affecting or predispose for neonatal infection. Factors like gravidity of the mother, gestational age, type of amniotic fluid membrane rupture and the type of delivery were not significantly associated with neonatal infection.

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